Crystallization of the $YAl_3(BO_3)_4$ phase in glasses of the system Y_2O_3 – Al_2O_3 – B_2O_3

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This work focuses on the crystallization of the $YAl_3(BO_3)_4$ (YAB) phase, which has attracted considerable attention, specially when doped with active rare earth ions, as a promising solid for lasing and non-linear optical applications. Various glass compositions in the system xY_2O_3 – *(40 –x)* Al_2O_3 – 60 B_2O_3, with $10 \leq x \leq 25$ (mol%), were prepared by the conventional melting/quenching method, with reagent grade Y_2O_3, Al_2O_3 and H_3BO_3. The materials were dry mixed and melted in a platinum crucible in an electric furnace with open atmosphere between 1400 -1500°C. According to differential thermal analysis (DTA) measurements, the glasses have presented glass transition temperatures (T_g) and crystallization temperatures (T_x) in the range 707-717°C and 812-818°C, respectively. The crystallization process was then performed between 800-1150°C. Beside the YAB phase, additional phases namely $Al_4B_2O_9$ and YBO_3, were identified by X-ray powder diffraction (XRD) in the glass-ceramic samples, depending on glass composition and thermal treatment. We find that heat treating the $x = 10$ glass composition at 1150°C during 1 h in an oxygen-controlled atmosphere maximizes the crystallization of rhombohedral YAB in this system.

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